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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,141	12/31/2003	Minco Yamakawa	INTEL1130 (P15612)	7926

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DLA PIPER RUDNICK GRAY CARY US, LLP
4365 EXECUTIVE DRIVE
SUITE 1100
SAN DIEGO, CA 92121-2133

EXAMINER	
STADLER, REBECCA M	
ART UNIT	**PAPER NUMBER**
1754	

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/750,141	YAMAKAWA ET AL.	
	Examiner	Art Unit	
	Rebecca M. Stadler	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *31 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *22-38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-38* are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12/31/2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-21, drawn to a process, classified in class 423, subclass 447.1.

II. Claims 22-30, drawn to a product, classified in class 257, subclass 1+.

III. Claims 31-38, drawn to a process, classified in class 156, subclass 1+.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product can be made without the step of removing the polymer molecules.

Inventions I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the inventions are different because the Group III invention pertains to aligning a wire with DNA molecules. The invention of Group I does not necessarily require DNA to align the polymer.

Inventions II and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the inventions are different because Group III pertains to aligning a wire with DNA molecules. The invention of Group II does not have any requirement for alignment.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different subject matter and classification, restriction for examination purposes as indicated is proper. There is a burden of search.

During a telephone conversation with Lisa Haile on December 5, 2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22-38 are

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

The disclosure is objected to because of the following informalities: on page 7, paragraph 26, the disclosure says: "protein 210 or peptide 210." Is there a corresponding protein or peptide for Figure 1? Figure 1 appears to be referenced in the paragraph. Also, the entire specification is confusing because there are numerals associated with the polymers, catalytic particles, et cetera, even when the diagram is not being discussed.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is unclear what "areas 110, 310" means (see specification page 6, paragraph 24). What is this in reference to? The diagrams? Is it a location on the substrate? Or is a crystallographic phase meant?

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a.) The step of removing the polymer during nanotube production is unclear. Are the carbon nanotubes free and unattached or are they somehow still attached to the substrate? If so, how are they still attached? Is the catalytic particle removed with the polymer? Is the catalytic particle attached to the substrate or the carbon nanotube or both or not at all? None of the Figures depict the carbon nanotubes, so it is difficult to figure out what the process produces.

Claim 15 recites the limitation "polymers are aligned" in line 1. There is insufficient antecedent basis for this limitation in the claim. Perhaps claim 15 is meant to be dependant on claim 14?

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 5-14, 18, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mau 6,886,801 in view of Dai 6,401,526.

As to claim 1, Mau '801 teaches the steps of: applying polymeric material to a substrate (see column 2, lines 30-32); removing the polymeric material (see column 2, lines 33-35, see also Figure 2a showing the self assembled polymer being removed); and producing carbon nanotubes (see column 2, lines 36-39). The catalyst of Mau '801 is not a nanoparticle. However, Dai '526 teaches a catalytic nanoparticle for use in the production of carbon nanotubes (see column 4, lines 21-37), which demonstrates that the use of catalytic nanoparticles are known to serve as activation sites for carbon nanotubes. Further, applicants admit that the use of catalytic nanoparticles is known to be an effective way to adjust the diameter of the carbon nanotubes produced (see specification page 5, paragraph 22). It would have been obvious to one of ordinary skill in the art at the time of this invention to use the catalytic nanoparticles of Dai '526 in place of the larger catalyst of Mau '801 in order to control the carbon nanotube diameter.

As to claims 5-9, Dai '526 appears to teach one or more nanoparticles on the block copolymer (see column 4, lines 19-37). Further, Dai '526 appears to attach the nanoparticles to

preselected locations. No difference is seen between the claimed placement of catalytic nanoparticles and the teachings in Dai. Finally, attaching the nanoparticle(s) either before or after the polymer molecules are attached to the substrate is not patenably distinct. It would have been obvious to attach the nanoparticles at any point in the process prior to producing the carbon nanotubes.

Respecting claims 10-13, Mau '801 discloses patterned aligned nanotubes (see figure 2). No difference is seen.

With regard to claim 14, Mau '801 appears to align the polymer molecules on the substrate (see figure 2).

As to claim 18, Mau '801 discloses producing carbon nanotubes by CVD with a hydrocarbon (see column 3, line 62 - column 4, line 9).

As to claim 20, Mau '801 discloses a substrate made of glass, quartz, silicon or any other suitable material (see column 2, line 64 – column 3, line 9).

As to claim 21, Mau '801 teaches that the catalyst may be (among others) nickel, iron, or cobalt (see column 4, lines 10-15).

Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mau '801 in view of Dai '526 as applied to claim 1 above, and further in view of Herr 2004/0072994.

Neither Mau '801, nor Dai '526 discloses the use of a polymer that is a peptide, protein or nucleic acid. Herr 2004/0072994 does disclose a method for producing nanotubes on a substrate with a catalyst attached to a moiety selected from the group of DNA, RNA, or proteins (see page 9, claims 47 and 50). It would have been obvious to use the polymers of Herr in the Mau in view of Dai process because the choice of polymer is not patentably distinct and Herr demonstrates that these polymers are effective for attaching catalysts.

Claim 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Mau '801 in view of Dai '526 as applied to claims 1, 9, 11, and 13 above, and further in view of Chan 6,696,022.

As to claim 15, Mau '801 does not teach how it aligns the polymer molecules. Chan '022 does disclose molecular combing for polymer alignment (see column 3, lines 62-64) and optical tweezers for alignment (see column 4, lines 28-31). It would have been obvious to use the method of Chan to align the polymer molecules because it aligns the molecules as desired by Mau.

Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Mau '801 in view of Dai '526 as applied to claim 1 above, and further in view of the Bonard reference.

Neither Mau, nor Dai disclose using ferretin as the catalyst for carbon nanotube production. The Bonard reference does disclose using ferretin as the catalyst for nanotube production. It would have been obvious to use the catalyst of Bonard in the Mau in view of Dai process because Bonard demonstrates that this catalyst catalyzes carbon nanotube production, which is the objective of both Mau and Dai.

Claim 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Mau '801 in view of Dai '526 as applied to claim 1 above, and further in view of Lieber 6,159,742.

Neither Mau, nor Dai disclose using biotin-avidin or biotin-streptavidin to bind the polymers to the nanotubes. However, Lieber '742 teaches that biotin-streptavidin is useful for adhesion of nanotubes and functionalizing groups (including polypeptides and nucleic acids) (see column 8, lines 14-54). Lieber also teaches avidin for binding purposes. It would have been obvious to use the ligand-receptor complex of Lieber in the Mau in view of Dai process because Lieber demonstrates that it is an effective means of binding something to a carbon nanotube.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rebecca M. Stadler whose telephone number is 571-272-5956.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

rms

STUART L. HENDRICKSON
PRIMARY EXAMINER